

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 March 2001 (22.03.2001)

PCT

(10) International Publication Number
WO 01/20424 A2

(51) International Patent Classification⁷: G06F

Three Forks, MT 59752 (US). WALL, Robert, Lyle; 222 Westridge Drive, Bozeman, MT 59715 (US). SWENSON, Charles, Glen; 101 Churn Road, Bozeman, MT 59715 (US).

(21) International Application Number: PCT/US00/15078

(22) International Filing Date: 1 June 2000 (01.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/137,352 3 June 1999 (03.06.1999) US

(74) Agents: KIRCHER, William, B. et al.; Shook, Hardy & Bacon L.L.P., One Kansas City Place, 1200 Main Street, Kansas City, MO 64105-2118 (US).

(81) Designated States (*national*): AU, CA, PL.

(71) Applicant: ANCHOR GAMING [US/US]; 2311 South 7th Avenue, Bozeman, MT 59715 (US).

(84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

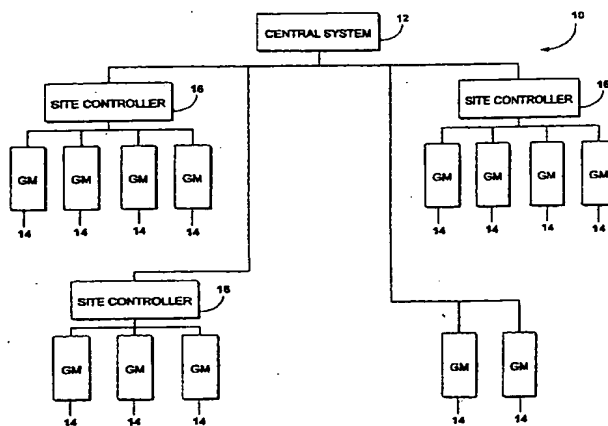
(72) Inventors: HARRIS, David; 9690 Forest Creek Drive, Bozeman, MT 59718 (US). KOURY, Mitchell, William; 622 South 15th, Bozeman, MT 59715 (US). MOODY, William, J.; 601 MacGregor Road, Belgrade, MT 59714 (US). BOLTON, Paul, W.; 410 Morocco, Bozeman, MT 59715 (US). AMICUCCI, Phillip, Louis; P.O. Box 1147,

Published:

— Without international search report and to be republished upon receipt of that report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND DEVICE FOR IMPLEMENTING A DOWNLOADABLE SOFTWARE DELIVERY SYSTEM



(57) Abstract: A method and device implementing a downloadable operatively connected to a plurality of gaming machines either by a direct communications link or through the use of one or more site controllers or PCs. Each gaming machine and site controller or PC contains two executable spaces, one of which typically contains the software image currently being implemented by the device. The other executable space is designated to receive from the central system a new software image that will be utilized by the device. The central system transfers a new image to be executed, via packet encrypted communications, to a networked device which stores the image in an executable space, while continuing to run the currently designated image. Upon instruction from the central system, the device switches over to the new image, allowing one or more machines to implement a software upgrade on a continuous basis.

WO 01/20424 A2

METHOD AND DEVICE FOR IMPLEMENTING A DOWNLOADABLE SOFTWARE DELIVERY SYSTEM

TECHNICAL FIELD

In general, this invention relates to a downloadable software system, and
5 more particularly, to a method and device implementing a downloadable software system
for an electronic gaming machine communications network.

BACKGROUND OF THE INVENTION

In general, conventional gaming machine networks typically include a
central system operatively connected to one or more individual gaming machines via
10 intermediate communication site controllers. Although the gaming machines
communicate with the central system, each gaming machine or site controller contains
a central chipset which locally stores the computer code to be executed by the device
to perform gaming related functions. These chipsets typically consist of electronic
programmable read only memory (EPROM) which permanently store the computer code.
15 EPROM chipsets are conventionally preferred because the electronic memory can be
controlled in a secured manner without giving unauthorized access to the gaming
machine code. For example, in the event the computer code needs to be upgraded,
service personnel are required to manually change the chipset for each gaming machine
and/or site controller.

20 Because a service technician must perform the same operation for each
machine or controller, the current method of upgrading gaming machine/site controller
or PC software typically takes a long time to accomplish at a substantial cost, including
the cost of the technician time and the cost of a new chipset for each machine.

Accordingly, there is a need for a system which can upgrade computer
25 code within a networked device without requiring a manual change in the device
components or requiring a high cost of implementation.

SUMMARY OF THE INVENTION

Generally described, a gaming machine system is provided. The gaming
machine system includes a central system and one or more gaming devices having at least
30 one storage component operable to receive an executable software image and in
communication with the central system. Additionally, the gaming device receives the
software image from the central system.

- 2 -

In another aspect of the present invention, a method in a computer system for implementing a gaming machine system including a central system in communication with one or more gaming devices is provided. In accordance with the method, a software image to be downloaded to the one or more gaming devices is obtained. The software image is downloaded to a selected group of the one or more gaming devices.

In a further aspect of the present invention, a method in a computer system for implementing a download of a software image is provided. In accordance with the method, a central process obtains a software image to be downloaded and transfers the software image to one or more device processes. The one or more device processes receives and stores the software image. At least one of the one or more device processes executes the software image.

In yet another aspect of the present invention, a gaming machine system is provided. The gaming machine system includes a central system and one or more gaming devices having storage means for receiving an executable software image. The one or more gaming devices are in communication with the central system. Additionally, the gaming machine system includes downloading means for transferring the software image from the central system to the one or more gaming devices.

A method and device implementing a downloadable software delivery system for an electronic gaming machine communications network is provided. A central system is operatively connected to a plurality of gaming machines either by a direct communications link or through the use of one or more site controllers. In this regard, it is contemplated that a PC or suitable computing device could be substituted for a site controller and that the downloadable software delivery still be effected. Each gaming machine and site controller or PC contains two executable spaces, one of which typically contains the software image currently being implemented by the device. The other executable space is designated to receive from the central system a new software image that will be utilized by the device. The central system transfers a new image to be executed, via packet encrypted communications, to a networked device which stores the image in an executable space, while continuing to run the currently designated image. Upon instruction from the central system, the device switches over to the new image, allowing one or more machines to implement a software upgrade on a continuous basis.

BRIEF DESCRIPTION OF THE DRAWING

- 3 -

The present invention is described in detail below with reference to the attached figures, wherein:

FIG. 1 is a block diagram of a gaming machine network utilized in accordance with the present invention;

5 FIG. 2 is a block diagram illustrative of various device components utilized in accordance with the present invention;

FIGS. 3A, 3B & 3C are flow diagrams illustrative of a software image transfer method utilizing random key encryption in accordance with the present invention;

10 FIGS. 4A & 4B are flow diagrams illustrative of an image transfer error checking and bypass process in accordance with the present invention;

FIG. 5 is a flow diagram illustrative of a software image transfer method to a gaming machine in accordance with the present invention; and

15 FIG. 6 is a block diagram illustrative of a software image parsing embodiment in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In essence, the present invention enables a central system operatively connected to a plurality of gaming machines and site controllers (or PCs) to upgrade one or more software images via a communications link without requiring a manual change
20 of the device chipset.

FIG. 1 is block diagram illustrative of a gaming machine network operable to be utilized by the present invention, designated generally by the reference numeral 10. Generally, the gaming machine network 10 includes a central system 12 operatively connected to a number of gaming machines 14 either by a direct communication link to
25 each individual machine 14 or indirectly through the one or more site controllers or PC's 16. The connectivity of the central system 12 to the gaming machines 14 can include continuous, on-line communication systems, including local area networks and/or wide area networks, or may be periodic, dial up semi-continuous communications. Because many gaming machine network currently utilize some type of communication network,
30 the present invention preferably utilizes the preestablished communication system between the central system and the gaming machines such as through telephone, cable, radio or satellite links. However, a dedicated software delivery communication network

- 4 -

may also be implemented and is considered to be within the scope of the present invention.

FIG. 2 is a block diagram illustrative of some of the components common to the gaming machines 14, site controllers 16 or other networked device (FIG. 1), generally referred to as a device 18, utilized in the present invention. Each device 18 preferably contains a processor 20, a memory 22, a communications input/output 24, such as a modem or network card, and at least two executable spaces 26. As would be readily understood by one skilled in the relevant art, the processor 20, memory 22 and communications input/output 24 includes any variety of component generally utilized in the implementation of the device. Moreover, in one embodiment, one or more of the executable spaces 26 are FLASH ROM. However, as would be readily understood, the executable spaces 26 may include DVD, CD-ROM, battery backed RAM or any other nonvolatile memory storage device.

Preferably, one executable space 26 is typically designated to store the software code, or image, currently being executed by the device 18. The other executable space is typically designated to receive a new image transferred by the central system. As would be understood, although the two executable spaces are preferably separate, the same effect is accomplished through the use of a single, larger executable space. In this embodiment, each device uses a portion of the executable space 26 to assist in receiving and storing incoming images from the central system.

As an alternative embodiment, the present invention may also be implemented with one executable space and sufficient other memory, which can include memory 22, to temporarily store a downloaded image. In this embodiment, the image would be downloaded to the temporary memory and then transferred to the more permanent executable space 26.

Generally, the present invention facilitates the implementation and replacement of a software image on a device in a gaming machine network by allowing the transmittal of a new image to a device while the device continues to execute and/or process a previous software image. Additionally, because the present invention may utilize one or more existing communication lines, the transfer of a new image can include various security and error checking features to ensure and preserve the secured character of the executable code.

- 5 -

FIGS. 3A, 3B & 3C are flow diagrams of an image downloading process utilizing a random key encryption in accordance with the present invention. With reference to FIG. 3A, at S28, the desired image to be downloaded is created, and loaded into the central system. Preferably, the operating system of the central system provides
5 a user interface, such as a graphical user interface, that allows a user to download the image to the central system's memory. Additionally, the user interface can include prompts for a user to enter additional information needed for the downloading process including download time information, download windows and version numbers. As would be understood, depending on the function of the image being downloaded, the
10 additional information needed to complete the download will vary.

Once the image has been downloaded to the central system, the user selects which devices are to receive the image. The user selection can include all of the devices or subsets of devices. Preferably, the central system includes some form of error checking that ensures that the designated device is compatible with the image to be
15 downloaded. At S30, the central system generates a random encryption key for each device designated to receive the image and encrypts the image with each of the random keys at S32. The random keys and encrypted images are stored in the central system memory. Additionally, the central system stores a completed, unencrypted version of the image in memory to use a signature for verification that the download is complete.

20 Generally, the function of a site controller (or PC) download differs from the function of the gaming machine download. Accordingly, at S34 a determination of whether the download is for a site controller is made. With reference to FIGS. 3A & 3B, if at S34 the desired image is designated to be downloaded to a site controller or PC, the random keys used to encrypt the image are themselves encrypted with a general
25 encryption key and sent to the site controller at S36. At S38, the site controller or PC decrypts the random keys and stores the keys in a memory, such as memory 22 (FIG. 2). The central system then sends the random key encrypted message to the site controller at S40. Once the download is complete, the central system sends additional instructions to the site controller such as to decrypt the image with the stored random keys or to store
30 the image into its second executable space.

With reference to FIGS. 3A & 3C, if at S34, the desired image is designated to be downloaded to a gaming machine or other device, the central system sends the encrypted message to the site controller (or PC) associated with the particular

- 6 -

gaming machine at S44, preferably in a manner as described above in steps S36-S42. At S46, the central system sends the site controller a list of the gaming machines to receive the image and their preassigned general encryption keys, which are encrypted with a key known to the gaming machine. At S48, the site controller transfers the encryption keys
5 to the gaming machine, which decrypts and stores the random keys in memory. The site controller then sends the random key encrypted image to the gaming machine at S50. Once the download is complete, the central system instructs the gaming machine, via the site controller, to prepare and store the image into its second executable space at S54.

With reference to FIGS. 4A & 4B, the present invention implements a
10 bypass and error checking function between the central system and the site controller or PC. Because the site controller can be associated with a number of gaming machines or other devices, once the site controller stores the image into its executable space, it does not need to reexecute the downloading step for each subsequent transfer to a gaming machine. With reference to FIG. 4A, the central system begins the download process
15 each time an image is to be transferred to a device as illustrated at S56. At S58, the central system checks whether a downloaded image has already been stored in the site controller's executable space. If so, at S60, the central system verifies that the signature of the image loaded on the site controller is correct and the transfer is complete at S72. With reference to FIGS. 4A & 4B if an image is not present in the site controller's
20 executable space at S58 or if the signature does not match at S60, the central system sends the image via packets to the site controller or PC at S62.

Preferably, the central system relies on package acknowledge signals from the site controller to ensure that each individual packet is received by the site controller. Accordingly, at S64, the central system determines whether all the packets have been
25 received. If one or more package acknowledge signals are not received, the transfer is incomplete at S70. At this point, the central system may resend the individual packets not received or may attempt to resend the entire image. Alternatively, the central system may just declare the transfer a failure.

If the packets are received and acknowledged at S64, the central system
30 completes the transfer at S66. At S68, the central system requests a signature of the image from the site controller to verify a proper transmission and decryption. With reference to FIGS. 4A & 4B, if the signature is a match, the download is a success at S72

- 7 -

and the site controller implements any downloading instruction. If the signature is not a match, the transfer is incomplete at S70.

With reference to FIG. 5, the present invention also implements an error transfer method for the downloading of an image from the site controller to the gaming machine. Upon receiving and storing the downloaded image in memory, the site controller (or PC) begins the download to the gaming machine at S74. Preferably as illustrated in FIG. 6, the software image 86 is organized into one or more frames 88 which are further organized into one or more blocks 92 per frame. Each of the blocks 92 can then be transferred as individual communication packets. During the download process, site controller transfers all packets that make up the frame with reference again to FIG. 5, at the end of the transfer frame the site controller requests an acknowledgment from the gaming machine at S70.

If the gaming machine did not receive some portion of the frame, the transfer is incomplete at S82. The site controller preferably resends only those packets which are incomplete. Alternatively, the entire image may be resent or the transfer may be declared a failure. Accordingly, the gaming machine does not need to acknowledge receipt of each packet. As would be understood, however, alternative methods of grouping and sending the software image would be considered within the scope of the present invention.

Upon the transfer of the entire image to the gaming machine at S78, the central system requests an image signature to verify the transfer was successful at S80. If the signature is a match, the transfer is successful at S84. If the image is not a match, the image is incomplete at S82.

The above-described transfer protocols have been incorporated with reference to two separate encryption methods. As would be understood, a system implementing only a portion, different or no encryption methods would be considered within the scope of the present invention.

Once the image has been successfully transferred to the device, the image can be executed. Preferably, the central system sends a command to the device to begin using the new image in the executable space. This command typically includes separate instructions for configuring the system to accommodate the new image and preventing the future play of the current image while the switch is occurring. Upon the completion of the command, the device begins executing the new image and the switch is complete.

- 8 -

Because the device contains at least two separate executable spaces, the old image previously being executed remains in the device executable space after the switch is complete. In the event that the new image is corrupt or not functioning properly, the central system can execute a command to revert to the old image if it is still
5 available and intact.

Although the devices specifically referenced in the present application refer solely to gaming machines or site controllers or PCs, the present invention allows images to be transferred to any device that is configured to receive an image. Such devices could include peripheral devices such as printers and bill acceptors or other
10 intermediate communications devices. As would be understood, the images associated with each device would vary with the type of device and its function in the system.

In the foregoing specification, the present invention has been described with reference to the specific exemplary embodiments thereof. It will be apparent to those skilled in the art that a person understanding this invention may conceive of
15 changes or other embodiments or variations, which utilize the principals of this invention without departing from the broader scope of the invention.

- 9 -

What is claimed:

1. A gaming machine system comprising: a central system; and one or more gaming devices having at least one storage component operable to receive an executable software image, wherein the one or more gaming devices are in communication with the central system; wherein the gaming device receives the software image from the central system.
2. The gaming machine system as recited in claim 1, wherein the central system includes a user interface for accepting the software image to be downloaded to the one or more gaming devices.
3. The gaming machine system as recited in claim 1, wherein the central system is in communication with the one or more gaming devices via a dedicated, continuous communication network.
4. The gaming machine system as recited in claim 1, wherein the central system is in communication with the one or more gaming devices via a nondedicated communication network.
5. The gaming machine system as recited in claim 1, wherein the central system is remote from at least one of the one or more gaming devices.
6. The gaming machine system as recited in claim 1, wherein the one or more gaming devices include at least one gaming machine.
7. The gaming machine system as recited in claim 1, wherein the one or more gaming devices include at least one site controller or PC.
8. The gaming machine system as recited in claim 1, wherein the at least one storage component of the one or more gaming devices includes a first executable space for storing an image currently being implemented by the gaming device and a second executable space operable to receive the software image to be downloaded.

- 10 -

9. The gaming machine system as recited in claim 8, wherein two or more the executable spaces are flash read only memory.

10. A method in a computer system for implementing a gaming machine system including a central system in communication with one or more gaming devices, the method comprising: obtaining a software image to be downloaded to the one
5 or more gaming devices; and downloading the software image to a selected group of the one or more gaming devices.

11. The method as recited in claim 10, wherein the obtaining step includes providing one or more user interfaces for receiving the software image from a
10 user.

12. The method as recited in claim 11, wherein the downloading step further comprises: encrypting the software image with a random key; and transferring the encrypted software image to the selected group of the one or more gaming devices.

13. The method as recited in claim 12, wherein the downloading step
15 further comprises: encrypting the random key with a general encryption key; and transferring the encrypted key to the selected group of the one or more gaming devices.

14. The method as recited in claim 12, where each gaming device within the selected group of the one or more gaming devices corresponds to a different random key.

20 15. The method as recited in claim 10, further comprising issuing to the selected group of the one or more gaming devices instructions to begin executing the downloaded software image.

16. The method as recited in claim 10, wherein the one or more gaming devices include at least one site controller or PC and at least one gaming

- 11 -

machine, wherein the downloading step includes transferring the software image and an instruction to download the image to the gaming machine to the site controller or PC.

17. The method as recited in claim 16, wherein the download step further comprises: detecting whether the site controller or PC contains a copy of the
5 image to be downloaded to the gaming machine; and if the copy is a valid image, canceling the download of the software image.

18. The method as recited in claim 10 further comprising issuing to the selected group of the one or more gaming devices instructions to cease executing the downloaded software image and revert back to a previous image.

10 19. A computer-readable medium having computer-executable instruction for performing the steps recited in claim 10.

20. A computer system having a processor, a memory and an operating environment, the computer system operable to perform the steps recited in claim 10.

21. A method in a computer system for implementing a download of
15 a software image, the method comprising: obtaining, by a central process, a software image to be downloaded; transferring, by the central process, the software image to one or more device processes; receiving, by the one or more device processes, the software image; storing, by the one or more device processes, the software image; and executing, by at least one of the one or more device processes, the software image.

20 22. The method as recited in claim 21, further comprising: encrypting, by the central process, the software image; and decrypting, by the one or more device process, the software image.

23. The method as recited in claim 21 further comprising issuing, by the central process, a command to begin executing the downloaded software image.

- 12 -

24. The method as recited in claim 21 further comprising issuing, by the central process, a command to cease executing the downloaded software image and begin executing a previous software image.

25. The method as recited in claim 21, wherein the transferring step includes: transferring, by the central process, the software image to a site controller process; receiving, by the site controller process, the software image; and transferring, by the site controller process, the software image to a gaming machine process.

26. The method as recited in claim 25, further comprising canceling, by the central process, the software image download if the site controller already has a copy of the software image.

27. A computer-readable medium having computer-executable instructions operable for performing the steps recited in claim 21.

28. A computer system having a processor, a memory and an operating system, the computer system operable to perform the steps recited in claim 21.

29. A gaming machine system comprising: a central system; one or more gaming devices having storage means for receiving an executable software image, wherein the one or more gaming devices are in communication with the central system; and downloading means for transferring the software image from the central system to the one or more gaming devices.

30. The gaming machine system as recited in claim 29, wherein the central system includes interface means for accepting the software image to be downloaded to the one or more gaming devices.

31. The gaming machine system as recited in claim 29, wherein the storage means include flash read only memory.

- 13 -

32. The gaming machine system as recited in claim 31, wherein the storage means include two separate flash read only memory components.

33. The gaming machine system as recited in claim 29, wherein the one or more gaming devices include at least one gaming machine.

5 34. The gaming machine system as recited in claim 29, wherein the one or more gaming devices include at least one site controller or compatible computing device.

1/8

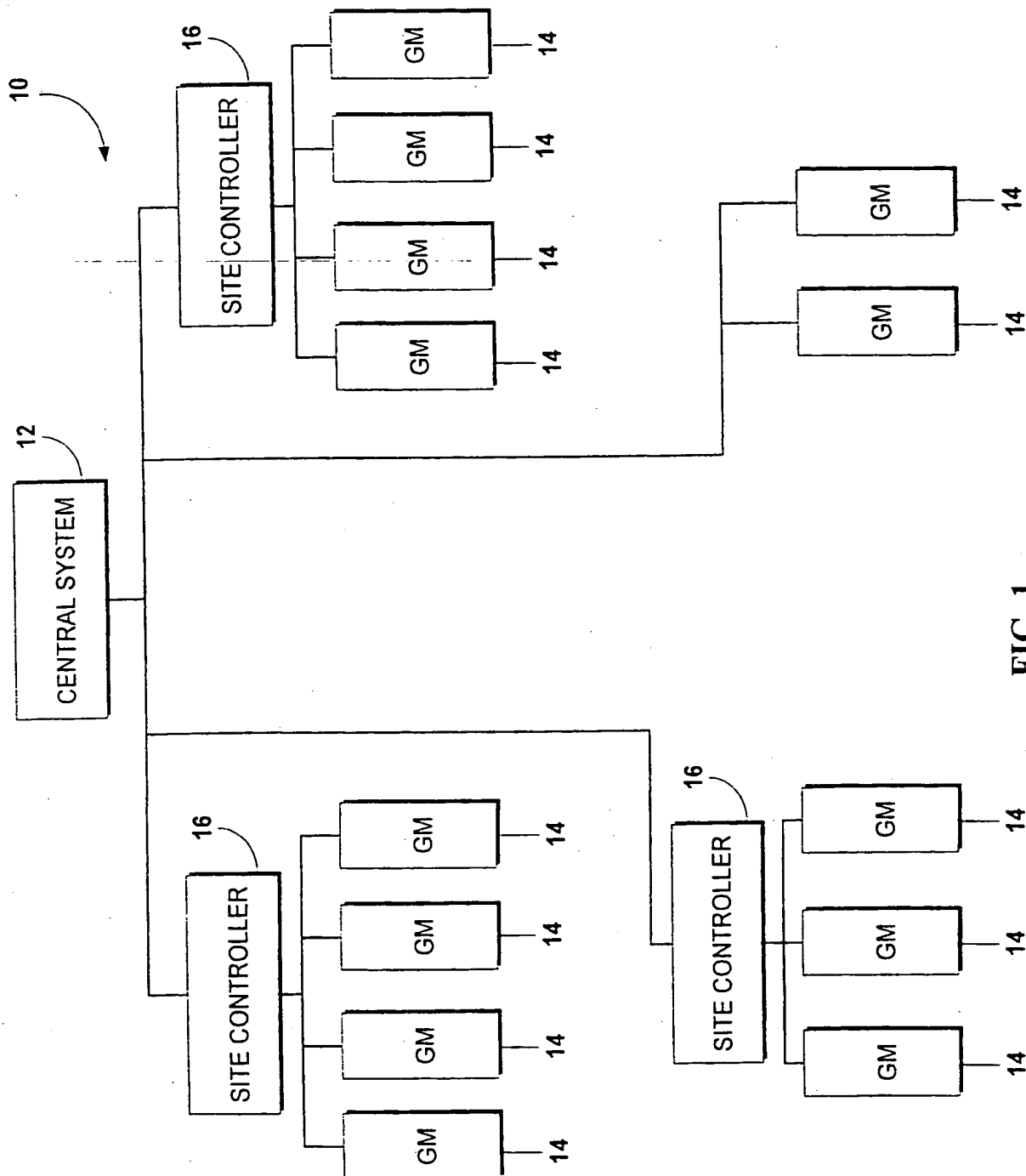


FIG. 1.

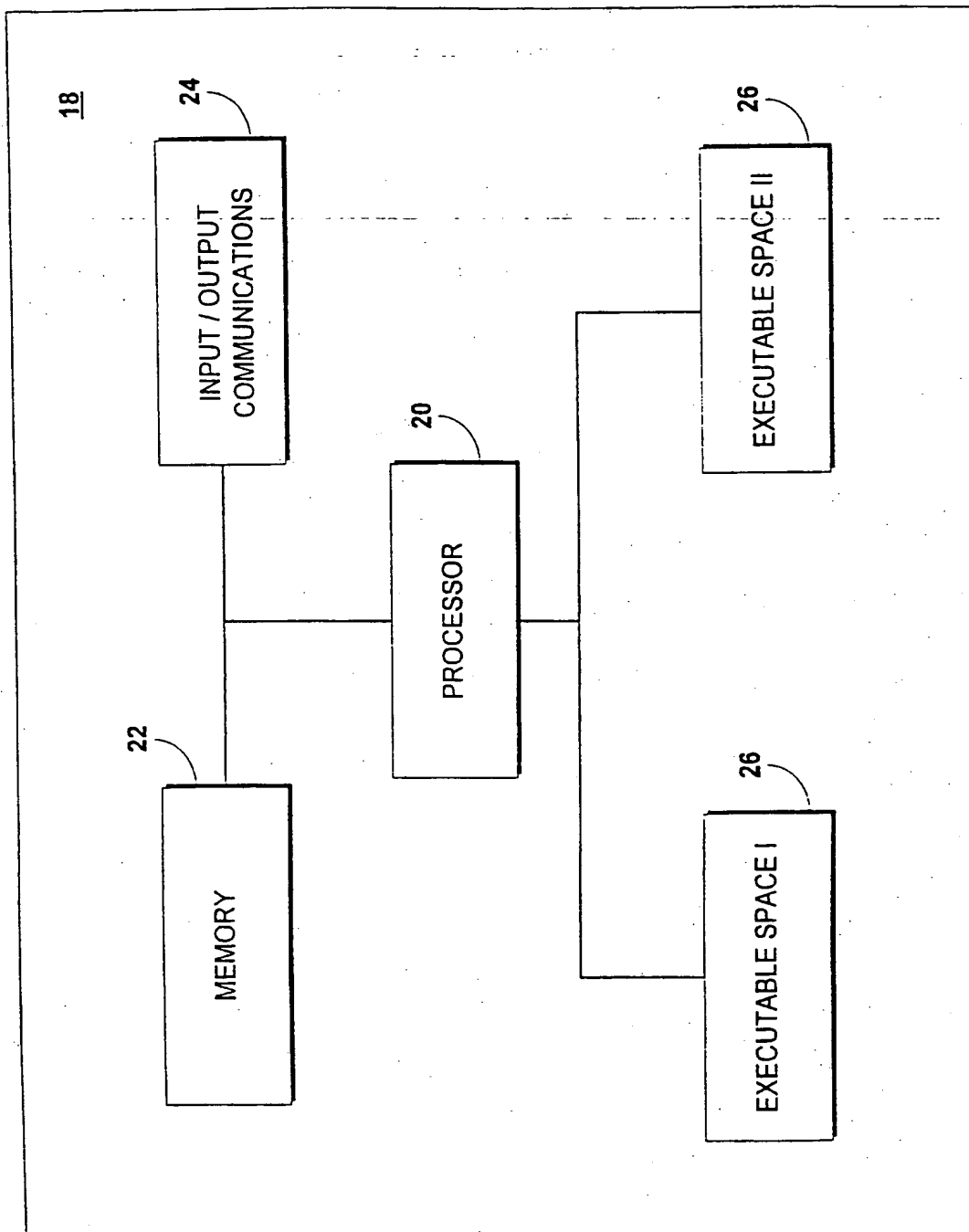


FIG. 2.

3/8

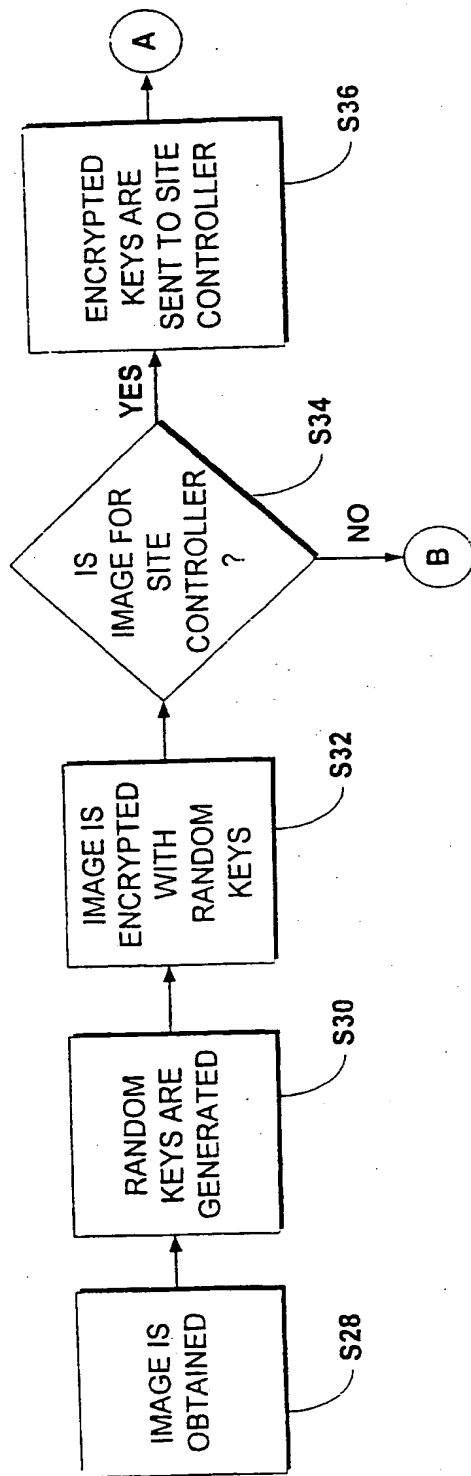


FIG. 3A.

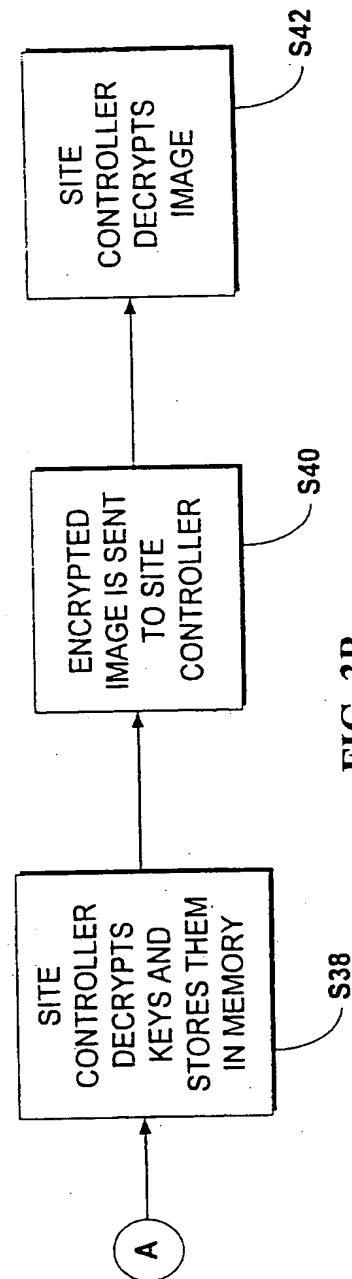


FIG. 3B.

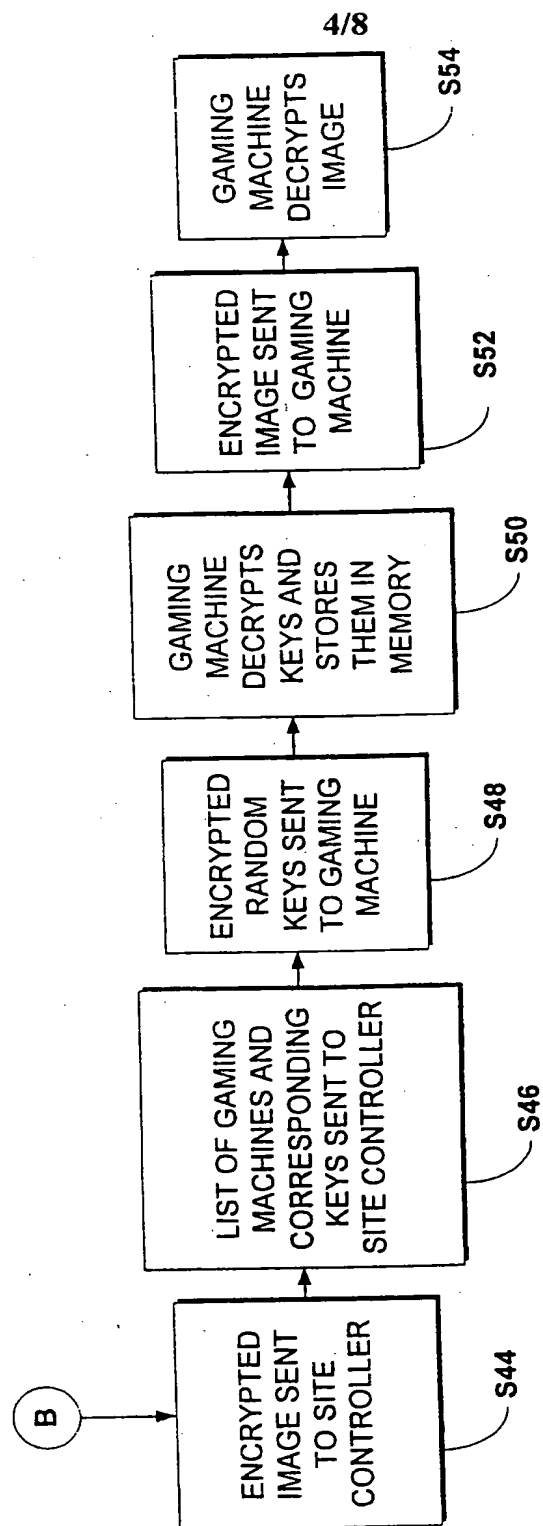


FIG. 3C.

5/8

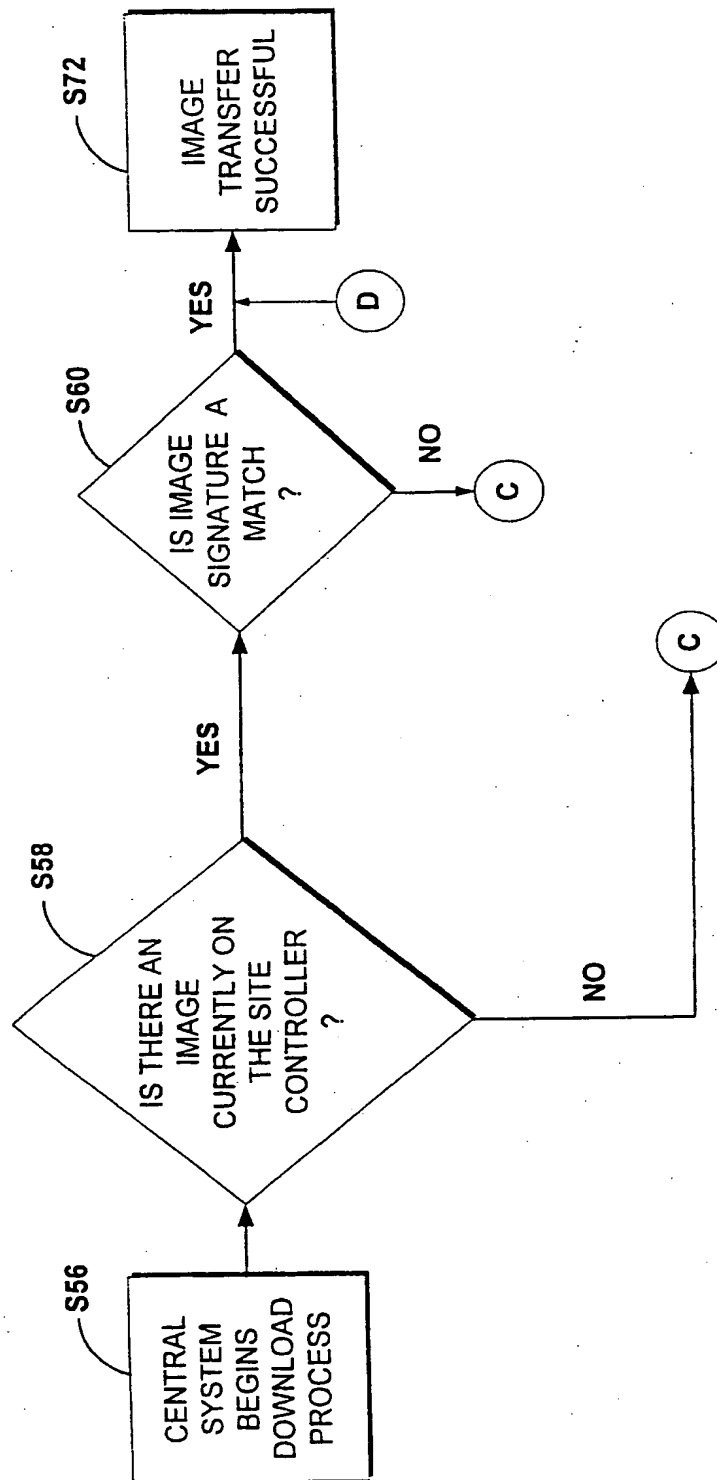


FIG. 4A.

6/8

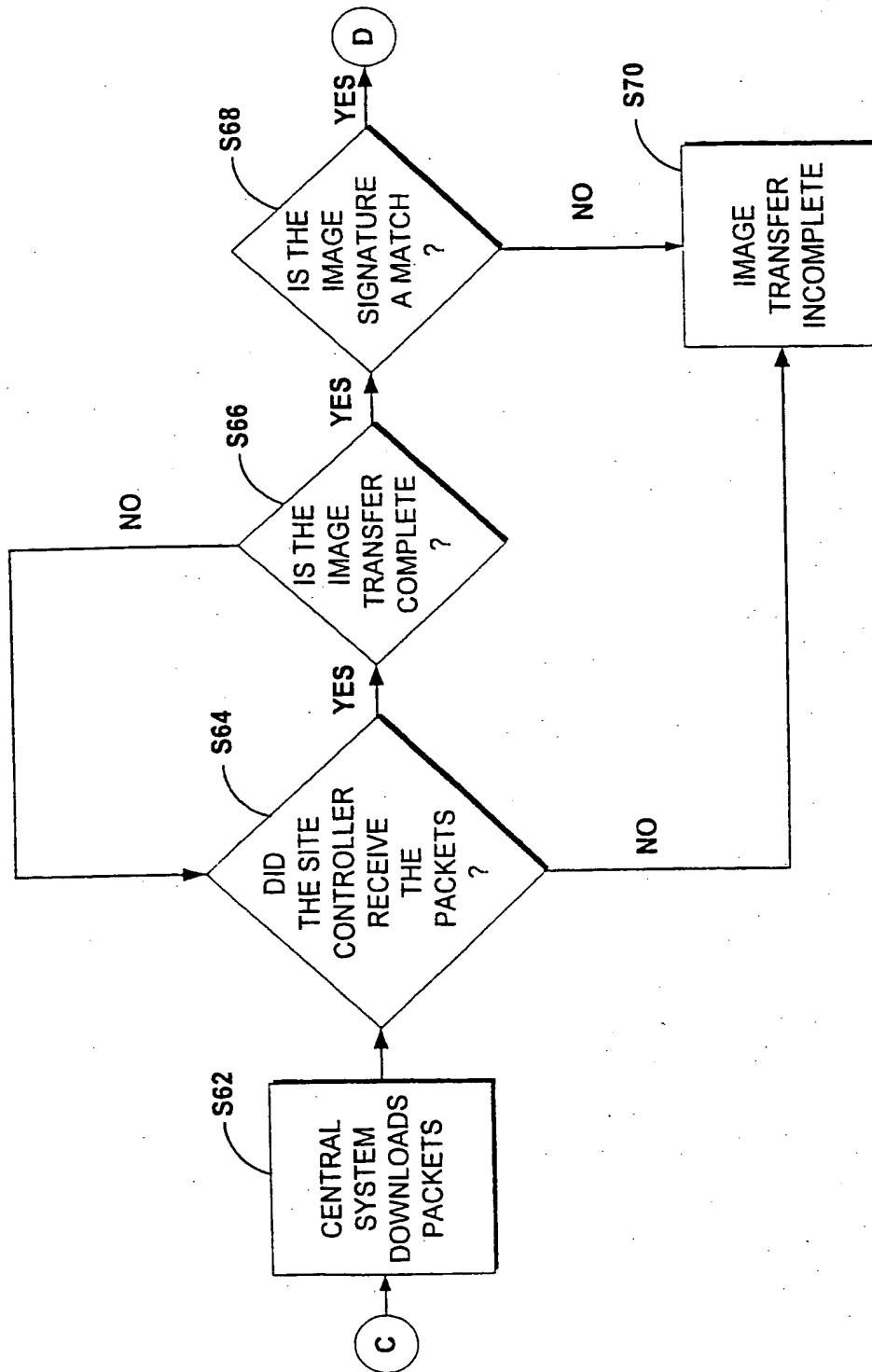


FIG. 4B.

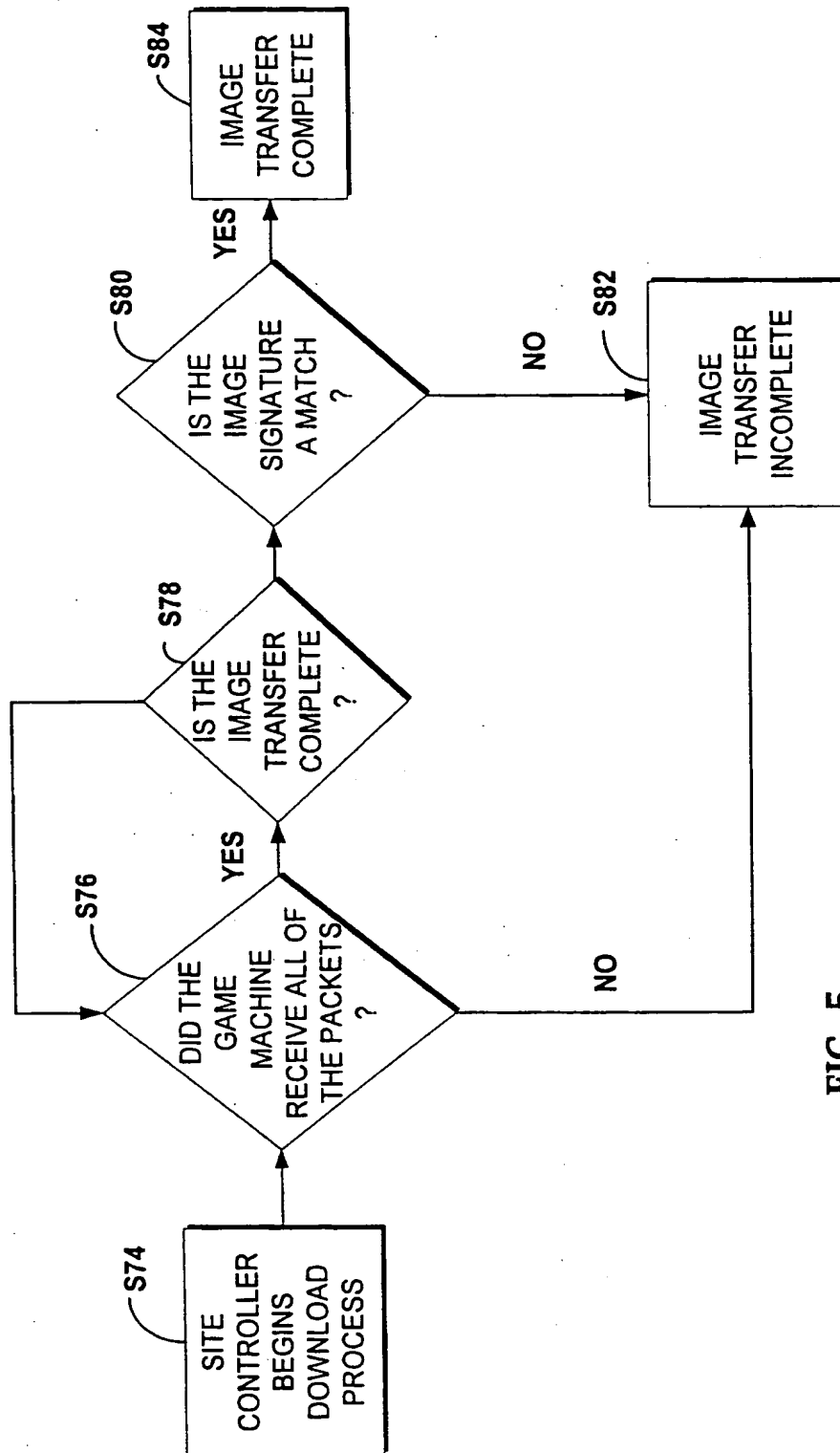


FIG. 5.

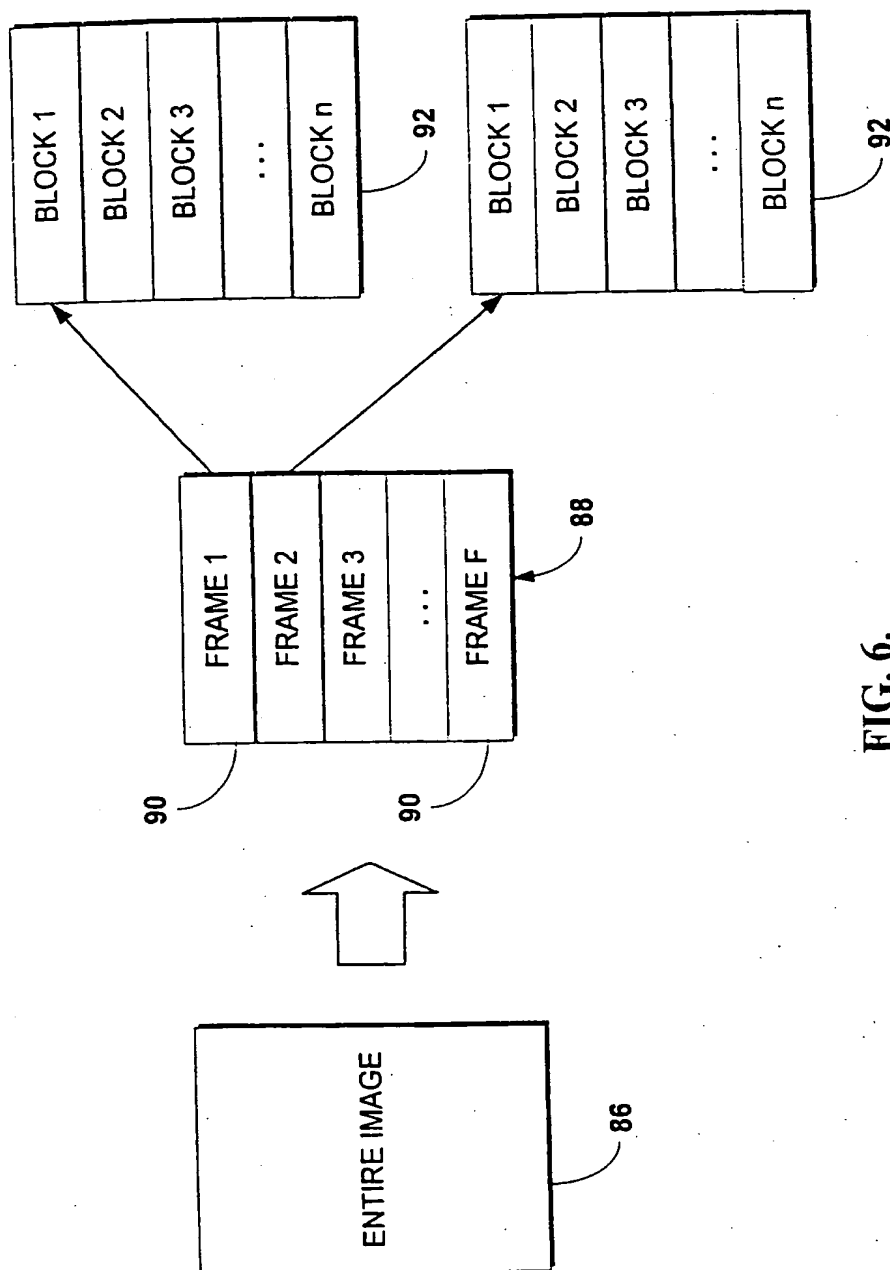


FIG. 6.